

REMARKS

Claims 1-5, 8-14 and 16-24, as amended, are presented for the Examiner's review and consideration. Claims 19 and 20 have been canceled. Since the amendments described herein do not introduce any new matter, their entry at this time is warranted.

Claims 19, 23 and 24 are rejected under 35 USC §103(a) as being unpatentable over US Patent No.6,191,007 to Matsui et al ("Matsui") taken with US Patent No. 6,107,213 to Tayanaka ("Tayanaka"). Applicants respectfully traverse this rejection.

In view of the cancellation of claim 19, the rejection of that claim is now moot.

Claim 23 which depended from claim 19 has been amended to depend from claim 1. For the reasons set forth below, claim 23 which incorporates all the features of claim 1 is not rendered obvious over Matsui, alone or in combination with Tayanaka. Likewise, claim 24 which depends from and incorporates all the features of claim 23 is not rendered obvious over Matsui, alone or in combination with Tayanaka.

Claims 1-4, 11, 16-18, 20-22 are rejected under 35 USC §103(a) as being unpatentable over Matsui taken with Tayanaka, as applied to claims 19, 23 and 24 and further in view of US Patent No. 5,920,764 to Hanson et al ("Hanson"). Applicants respectfully traverse this rejection.

In view of the cancellation of claim 20, the rejection of that claim is now moot.

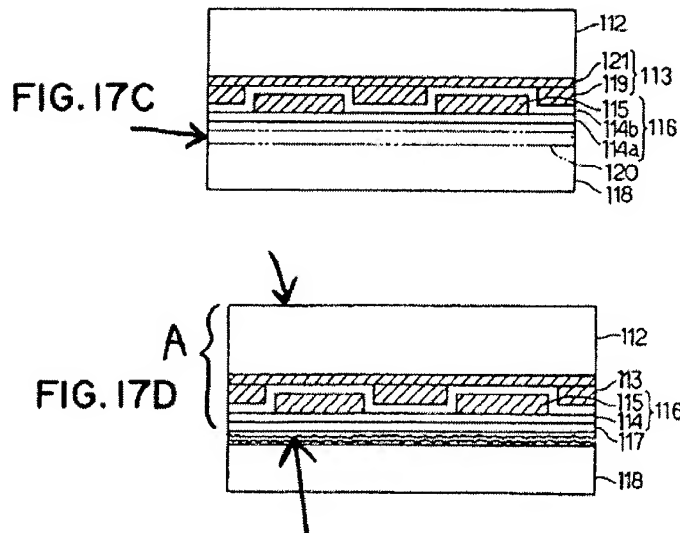
Claim 1 is directed to a method of providing a self-supporting electronic component or circuit on a thinned support formed by thinning a wafer made of semiconductor material. The process comprises providing a wafer having a first face supporting at least one electronic component or circuit that is exposed, the wafer having an opposing second face, implanting atomic species through the second face and into the wafer without passing through the electronic component or circuit to obtain a zone of weakness at a predetermined depth therein, the zone defining a first portion of the wafer extending from the zone to the first face and at a thickness sufficient to self-support the electronic component or circuit, with a remaining portion constituted by the remaining portion of the wafer, applying a stiffener to the second face of the wafer prior to removing the remaining portion, removing the stiffener and the remaining portion from the first portion along the zone of weakness to thin the wafer to the self-supporting thickness, with the electronic component or circuit remaining exposed on the first face, to provide a new second face opposite the first face on the first portion; and

repeating the implanting and removing steps if necessary until the first portion has a reduced thickness for constituting a self-supported thin layer for the exposed electronic component or circuit supported on the first face.

Matsui teaches methods for manufacturing semiconductor substrates in which a semiconductor layer for forming semiconductor device therein is formed on a supporting substrate with an insulating film interposed between them, with which in forming the semiconductor layer on a substrate on which a buried pattern structure has been formed it is possible to greatly increase the film thickness uniformity of the semiconductor layer and the film thickness controllability, particularly when the semiconductor layer is being formed as an extremely thin film. (Abstract). Also, the base substrate (for example, the substrate 112 in FIGS. 17C and 17D) that is bonded to the original wafer in Matsui serves as a “supporting substrate” (Specification, at 31:27-30), and must be sufficiently thick to support the structure during the subsequent splitting as shown in the figures. Consequently, even if the pattern of Matsui were assumed to be on a face of the wafer in FIGS. 17 and 22, during and after the splitting, the pattern cannot be said to remain on the same face of the wafer because the pattern is now separated from the face that was opposite from the implantation by the thick support substrate.

It is noted that the main faces of a semiconductor wafer are much like those of a coin. Any submerged region well buried within the coin is not considered to be a face. Similarly, the pattern in Matsui after splitting is not on a face that was opposite from the face through which the ions were implanted in FIG. 22. It is buried well below the thick support layer.

Also, the new face formed by splitting (indicated by the bottom arrow in FIG. 17D reproduced below) was not a face at all at the beginning of the Matsui process, but it was at a level submerged within the original wafer (indicated by an arrow in FIG. 17C below), which is why the ions were required to be implanted. This submerged level becomes a new face only after the splitting, when the portion of the wafer below that level is removed, and the resulting wafer (denoted “A” below) has the two faces denoted by the arrows drawn onto FIG. 17D as reproduced below. Thus, the pattern in Matsui does not remain on any one face during the transfer process.



In addition, because the purpose of the Matsui process is to transfer the pattern from the substrate 118 to the base substrate 112, it would not be possible to perform the transfer as done in Matsui, while maintaining the pattern on the same face of the wafer as recited in claim 1. Therefore, Matsui bonds the device to a support and then transfers it before thinning and the device layer is not exposed, and the base substrate is not located between the pattern and the implanted layer and provides the support for the pattern at least after splitting. In contrast, Applicant's invention as recited in claim 1 relates to transferring a pattern from one substrate to another and utilizing a thinning method which keeps the electronic component or circuit remaining on the original face of the original wafer. As stated by the Examiner, Matsui lacks applying a stiffener to a second face prior to the removing step. Matsui also lacks repeating the implanting and removing steps until the first portion has a reduced thickness. Therefore, a person skilled in the art interested in solving the problem solved by Applicants' invention would not look to Matsui.

Tayanaka does not remedy the deficiencies of Matsui. As stated in the Office Action, Tayanaka teaches the application of a stiffener to both first and second faces of a wafer prior to removing portions thereof. Furthermore, Tayanaka does not disclose or suggest thinning a wafer, or maintaining an electronic component or circuit on one face as recited in claim 1.

Hanson teaches does not remedy the deficiencies of Matsui alone and taken with Tayanaka. As stated by the Examiner, Matsui, Tayanaka and Hanson lack the use of a stiffener, a feature recited in claim 1. Therefore, a person skilled in the art interested in

solving the problem solved by Applicants' invention would not look to Hanson to remedy the deficiencies of Matsui, alone or in combination with Tayanaka.

Claim 5 is rejected under 35 USC §103(a) as being unpatentable over Matsui taken with Tayanaka and Hanson as applied to claims 1-4, 11, 16-18, 20-22 and further in view of US Patent No. 6,291,314 to Henley ("Henley").

Claim 5 recites that the remaining portion of the wafer is being removed by blowing a jet of fluid adjacent the zone of weakness. As discussed above, claim 1 is not rendered obvious over Matsui taken with Tayanaka and Hanson. Therefore, claim 5 which incorporates the features of claim 1 is not rendered obvious over Matsui taken with Tayanaka and Hanson.

Henley teaches a technique for forming a film of material having active devices from a donor substrate. The technique has a step of introducing energetic particles in a selected manner through a surface and active devices of a donor substrate a selected depth underneath the active devices, where the particles have a relatively high concentration to define a donor substrate material above the selected depth. The surface of the donor substrate is attached to a release layer on a transfer substrate. An energy source is directed to a selected region of the donor substrate to initiate a controlled cleaving reaction of the substrate at the selected depth, whereupon the cleaving action provides an expanding cleave to free the donor material from a remaining portion of the donor substrate. The transfer substrate holds the cleaved material and is used to transfer the cleaved material with active devices onto a target substrate. (Abstract).

As stated by the Examiner, Matsui, Tayananka and Hanson lack blowing a jet of fluid adjacent the zone of weakness. Henley teaches that an energy source is directed to a selected region of the donor substrate to initiate a controlled cleaving reaction of the substrate at the selected depth, whereupon the cleaving action provides an expanding cleave to free the donor material from a remaining portion of the donor substrate. Therefore, a person skilled in the art interested in solving the problem solved by Applicants' invention would not look to Henley to remedy the deficiencies of Matsui, alone or in combination with Tayanaka, alone or in combination with Hanson. Therefore, claim 5 is not rendered obvious over Matsui taken with Tayanaka, Hanson and Henley.

Claims 12-14 are rejected under 35 USC §103(a) as being unpatentable over Matsui taken with Tayanaka and Hanson as applied to Claims 1-4, 11, 16-18, 20-22, and further in view of US Patent No. 6,202,252 to Aspar et al ("Aspar") and US Publication No. 2002/005537 to Sayyah ("Sayyah").

Claim 12 is directed to a stiffener comprising a flexible film. Claim 12 incorporates the features of claim 1.

Claim 13 is directed to a stiffener comprising an adhesive film. Claim 13 incorporates the features of claim 1.

Claim 14 is directed to a stiffener comprising a layer of wax. Claim 14 incorporates the features of claim 1.

As discussed above, claim 1 is not rendered obvious over Matsui taken with Tayanaka and Hanson. Claims 12-14 which incorporate the features of claim 1 are thus not rendered obvious by Matsui taken with Tayanaka and Hanson.

As stated by the Examiner, Matsui, Tayanaka and Hanson lack the use of a stiffener comprising a flexible film or an adhesive film or a wax layer. Aspar teaches applying a stiffener comprising a rigid or flexible support. Sayyah teaches using a release stiffener layer comprising an adhesive/wax layer. Therefore, a person skilled in the art interested in solving the problem solved by Applicants' invention would not look to Aspar or Sayyah the deficiencies of Matsui, alone or in combination with Tayanaka, or alone or in combination with Hanson. Therefore, claims 12-14 are not rendered obvious over Matsui taken with Tayanaka, Hanson, Aspar and Sayyah.

Under the Court's decision in *KSR*, there must be a reason for a person of ordinary skill in the art to combine the elements claimed in order for it to exist a finding of obviousness.¹ As set forth above, with regard to claim 1, there is no reason to combine the teachings of Matsui taken with Tayanaka and Hanson. Therefore, claim 1 is not rendered obvious over Matsui taken with Tayanaka and further in view of Hanson and claims 2-4, 11, 16, 18 21 and 22-24 which incorporate the features of claim 1 are not rendered obvious over Matsui taken with Tayanaka and further in view of Hanson. With regard to claim 5, there is

¹ *KSR*, 127 S. Ct. at 1741 ("Often, it will be necessary for a court to look to interrelated teachings of multiple patents...in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent in issue.").

no reason to combine the teachings of Matsui taken with Tayanaka, Hanson and Henley and claim 5 is not rendered obvious over Matsui taken with Tayanaka, Hanson and Henley. With regard to claims 12-14, there is no reason to combine the teachings of Matsui taken with Tayanaka, Hanson, Aspar and Sayyah and claims 12-14 are not rendered obvious over Matsui taken with Tayanaka, Hanson, Aspar and Sayyah. Therefore, withdrawal of the rejections of claims 1- 5, 8-14, and 16-18, 21-24 is respectfully requested.

Accordingly, this Application is now in condition for allowance, early notice of which would be appreciated. Should any issues remain outstanding, a personal or telephonic interview is respectfully requested.

Date: _____

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Respectfully submitted,


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